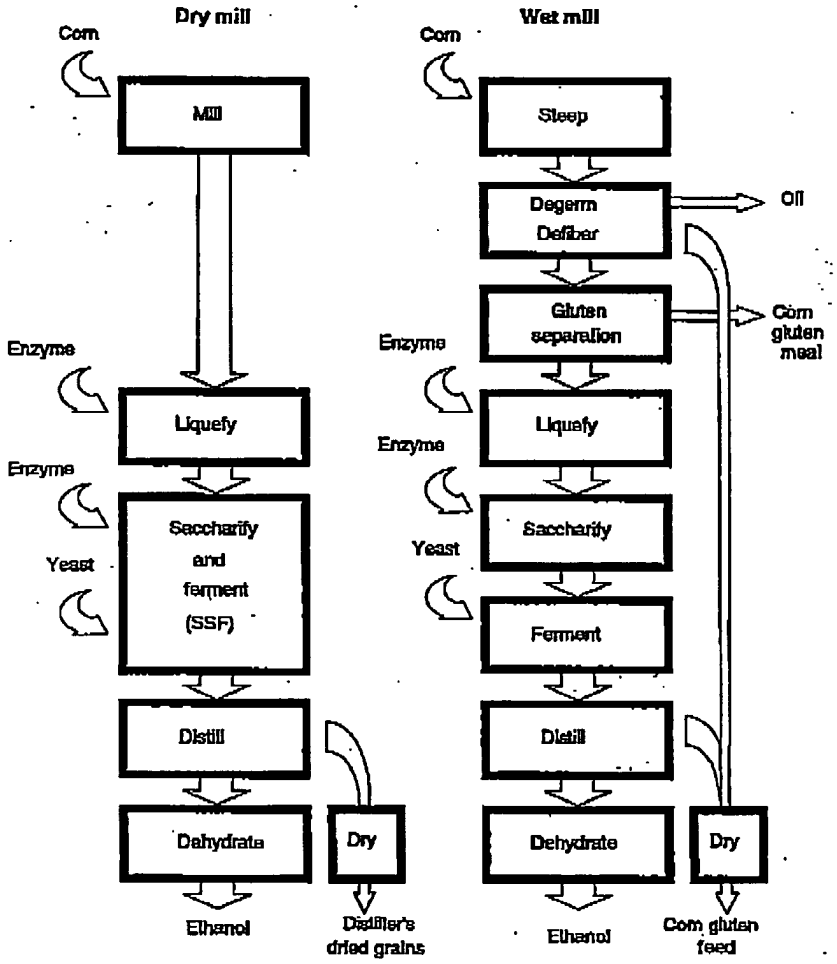
REMARKS

Claims 1-3 have been cancelled without prejudice. Claims 4-5 had previously been withdrawn. New claims 6-8 are pending in this case.

The claimed invention is an improved ethanol production process. There are two basic ethanol production processes: wet milling and dry milling. The following flowchart (see Hohmann et al, USDA-ERS study entitled "*Emerging Technologies in Ethanol Production*" at p. 3) is illustrative of the basic steps in each of the two process.



Thus, in a dry milling ethanol production process ethanol is the primary product and a distiller's dried grain (DDG) or distiller's dried grain with solubles (DDGS) are principal the co-products obtained. Although not reflected in the above schematics some ethanol production plants also recover by distillation the carbon dioxide generated during the fermenting step. There have also been proposed modified ethanol product plants to recover lactic acid (e.g., U.S. Patent 5,503,750), zein proteins (e.g., U.S. Patent 7,045,607), and other valuable by-products contained in the corn feedstock or formed during the normal fermentation of the liquefied mash (e.g., U.S. Patent 5,316,782). In these prior art processes the approach has generally been to either to utilize a portion of the feedstock in a separate treatment process that may use some of the ethanol produced as an extracting agent in the separate treatment process or that will use the by-product from the separate treatment process as a part of the feedstock to the ethanol production process. Other of these prior art processes propose modifying or specially treating the whole stillage or fractions thereof to obtain the desired by-product. In the traditional wet milling process ethanol is again the primary product. However, in this process the whole corn is first broken down into its various constituent parts. Each of the parts are then separately treated to obtain the desired by-products: corn oil from the germ, corn gluten meal and corn gluten feed from the hull, fibers and germ de-oiled residue. The starch-containing portion of the corn is then used to produce the ethanol.

However, in neither type of ethanol production process does any of these prior art processes teach or suggest modification by use of a secondary treatment agent the liquefied mash during the saccharification/fermentation step to produce a modified beer that contains the desired product, or precursor thereof.

It is important to understand the claimed invention differs from the prior art in that based on the feedstock it permits the plant operator previously unobtainable flexibility in selecting from a wide range of by-products what by-products can be recovered. Thus, if current market conditions change, and one possible by-product becomes more valuable than the currently produced by-products, the plant operator has the ability to modify the process by simply changing the secondary treatment agent with little or no effect on the amount of ethanol being recovered and without having to expend additional capital for equipment to generate the desired by-product. It has long been recognized (see p.8 of attached Hohman et al study) that one of the best potential economic gains in ethanol production process lies in the ability to obtain high-value by-products from the process. Despite this long felt need and the large sum of research monies and manpower spent no one prior to this invention has discovered a method that permits the flexibility of by-product selection without the need for expensive capital investment and without the loss of any significant ethanol production.

Applicants first recognized that the most desirable way to produce the desired by-product would be simultaneously with the saccharification or fermentation of the liquefied mash. This process step results in the desired by-product (or its precursor) being contained in the resulting beer. Thus, this step avoids the additional capital costs of separate process equipment found in many prior art processes that separately treat a portion of the feedstock to generate and recover desired by-products. In addition it permits the use of equipment already in place in a conventional ethanol production plant. Secondly, applicants discovered that this simultaneous step can be achieved without any significant decrease in ethanol production; i.e., applicants' process does not prevent the

formation of the beer. To persons of ordinary skill in ethanol production beer refers to the resultant fermentation product containing at least 10% v/v ethanol (see the attached USDA studies). If ethanol production is inhibited so that this beer can not be produced, then the economic viability of the ethanol production plant is questionable. Applicants claimed invention avoids both the need for expensive new equipment, as well as does not prevent the formation of the beer necessary for an economically viable ethanol production plant.

These unexpected benefits are achieved by the proper selection of the treatment agent that will be introduced directly into the fermentation vessel during the saccharification or fermentation step. The treatment agent must have the following characteristics:

(a) the secondary treatment agent is selected from a group consisting of bacteria, enzymes, fungi, or combinations thereof, that can convert under the fermentation conditions at least a portion of the liquefied mash to a pre-selected non-ethanol by-product or precursors thereof;

(b) the secondary treatment agent has the characteristics of remaining active in the presence of the ethanol contained in the beer being formed during the fermenting of the liquefied mash,

(c) the secondary treatment agent under the fermentation conditions converts at least a portion of the liquefied mash during the fermenting of the liquefied mash into the pre-selected non-ethanol by-product or precursors thereof, and

(d) the activity of the secondary treatment agent does not prevent the fermentation of the liquefied mash to produce the beer having at least 10% ethanol by volume.

Prior Art Cited in Previous Office Action

In the June 7, 2007 Office Action it had been argued that the now cancelled claims 1-3 under 35 USC §102 (b) were anticipated by the Lima et al article entitled "*β-Cyclodextrin Production by Simultaneous Fermentation and Cyclization.*" Lima examines the production of *β-Cyclodextrin* from starch hydrolysates, such as high-dextrose equivalent (DE) cassava starch based hydrolysates. More particularly, Lima discloses three primary methods for producing *β-Cyclodextrin* from a hydrolyzed cassava starch slurry. These three primary methods are: (i) treating the hydrolyzed cassava starch slurry only with CGTase enzyme, (ii) treating the hydrolyzed cassava starch slurry with both CGTase enzyme + ethanol, and (iii) treating the hydrolyzed cassava starch slurry with the combination of CGTase enzyme + yeast + nutrients. It is only in this latter method, referred to as the Simultaneous Fermentation and Cyclization Process (SFC Process), that both an enzyme and an yeast are used simultaneously to produce the desired *β-Cyclodextrin*.

There are significant differences between the Lima methods and the claimed ethanol production process defined in claims 6-8. First, none of the three primary methods disclosed in Lima are an ethanol production process. This is clearly pointed out by Lima in Table 2 at p. 802. Using the SFC Process results in the production of no more than 2.18% v/v ethanol even when DE=26.06. The other methods produce even less ethanol. Thus, none of the methods disclosed in Lima result in the production of

beer (i.e., containing >10% by volume ethanol) from the hydrolyzed cassava starch. Still further, there is no teaching or suggestion in Lima that both *β-Cyclodextrin* and beer could be produced simultaneously in a yeast fermentation process wherein CGTase is added to the fermentation vessel during the fermentation process. If anything, Lima would appear to teach that such results would not be expected.

Although not cited in the previous Office Actions applicants notes that there are prior art references that disclose the use of more than one saccharification agent or more than one fermenting agent. An example of such references is U.S. Patent 5,231,017 (copy attached). In these references the additional agent is selected for its ability to increase the amount of ethanol produced, and not for the formation of a pre-selected non-ethanol by-product that can be recovered in the resultant whole stillage.

CONCLUSION

Based upon the foregoing comments, the application is believed to be in condition for allowance, and an early Notice of Allowability is respectfully requested. If the examiner believes a telephone conference will expedite the disposition of this matter, the examiner is respectfully invited to contact this attorney at the number shown below.

Respectfully submitted:

Dated: December 3, 2007

William David Kiesel
Reg. No. 28,583
ROY, KIESEL, KEEGAN & DENICOLA
2355 Drusilla Lane
P.O. Box 15928
Baton Rouge, LA 70895
(225) 927-9908

Attachments:

- Hohmann et al, USDA-ERS study entitled "*Emerging Technologies in Ethanol Production*" (January 1993)
- Dien et al, USDA-ARS study entitled "*The U.S. Corn Ethanol Industry: An Overview of Current Technology and Future Prospects*" (April 2002)
- Rendleman et al, USDA Agricultural Economic Report No. 842 entitled "*New Technologies in Ethanol Production*" (February 2007)
- U.S. Department of Energy Office of Science article entitled "*Genomics: GTL – Systems Biology for Energy and Environment*" (original publication date not known)
- U.S. Patent 5,231,017
- U.S. Patent 5,316,782
- U.S. Patent 5,503,750
- U.S. Patent 7,045,607